

# Fall Chinook Salmon Spawning Ground Surveys in the Snake River Basin upriver of Lower Granite Dam

Annual Report 2005 - 2006

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# **Fall Chinook Salmon Spawning Ground Surveys in the Snake River Basin Upriver of Lower Granite Dam, 2005**

## **Annual Report**

for project: 1998-010-03

Contract period: November 2005 – October 2006

including findings from projects  
1983-350-03 and 1998-010-04

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## **Introduction**

Redd counts are routinely used to document the spawning distribution of fall Chinook salmon (*Oncorhynchus tshawytscha*) in the Snake River basin upriver of Lower Granite Dam. The first reported redd counts were from aerial searches conducted intermittently between 1959 and 1978 (Irving and Bjornn 1981, Witty 1988; Groves and Chandler 1996)(Appendix 1). In 1986, the Washington Department of Fish and Wildlife began an annual monitoring program that, in addition to the Snake River, included aerial searches of the Grande Ronde River the first year (Seidel and Bugert 1987), and the Imnaha River in subsequent years (Seidel et al. 1988; Bugert et al. 1989–1991; Mendel et al. 1992). The U. S. Fish and Wildlife Service and Idaho Power Company began contributing to this effort in 1991 by increasing the number of aerial searches conducted each year and adding underwater searches in areas of the Snake River that were too deep to be searched from the air (Connor et al. 1993; Garcia et al. 1994a, 1994b, 1996–2005; Groves 1993; Groves and Chandler 1996). The Nez Perce Tribe added aerial searches in the Clearwater River basin beginning in 1988 (Arnsberg et. al 1992), and the Salmon River beginning in 1992. Currently searches are conducted cooperatively by the Nez Perce Tribe, Idaho Power Company, and U. S. Fish and Wildlife Service.

Our objective for this report was to consolidate the findings from annual redd searches into a single document, containing detailed information about the searches from the most recent spawning season, and summary information from previous years. The work conducted in 2005 was funded by the Bonneville Power Administration and Idaho Power Company.

## **Study Area**

The study area included the free-flowing Snake River between Lower Granite and Hells Canyon dams and portions of the major tributaries that enter therein (Figure 1). We refer to locations using river miles (RM) and river kilometers (RK) based on navigation charts of the Snake River (USACE 1990) and U.S.

Geological Survey topographical maps. In 2005, searches focused on eight river reaches: (1) the Snake River from the head of Lower Granite Reservoir (RM 147; RK 237) to Hells Canyon Dam (RM 247; RK 397), (2) the Clearwater River to the North Fork Clearwater River (RM 41; RK 66), (3) the North Fork Clearwater River to Dworshak Dam (RM 2; RK 3), (4) the Clearwater River to the South Fork and Middle Fork Clearwater river confluence (RM 74; RK 119); (5) the South Fork Clearwater River to Butcher Creek (RM 12; RK 19), (6) the Grande Ronde River to Wildcat Creek (RM 53; RK 85), (7) the Salmon River to French Creek (RM 105; RK 169), and (8) the Imnaha River to the Cow Creek Bridge (RM 20.7; RK 33.3). The number of searches per reach varied between reaches and years. Searches were conducted in other portions of the aforementioned Snake River tributaries, in the Tucannon River, and in the Potlatch River and Asotin Creek, though less consistently.

## **Methods**

Redd searches were conducted from a helicopter flown at an altitude of about 700-ft. or less. At minimum, observations were made by a primary observer and the pilot, though typically at least one additional observer was present. Redd locations were determined by referencing navigation charts of the Snake River (USACE 1990), or U. S. Geological Survey topographical maps, or using the Global Positioning System (GPS) coupled with mapping software. From 1991 to 2005, searches in the Snake, Clearwater, Grande Ronde, and Imnaha rivers were scheduled to be conducted at 7-d intervals starting around mid-October and ending around mid-December. In previous years, and in the other rivers, searches were generally conducted less frequently. In most years some scheduled searches were canceled or shortened due to poor visibility or inclement weather. Redds observed in the Snake River that could not clearly be distinguished from the air were examined from the ground (hereafter referred to as ground truthing) beginning in 1991. Ground truthing was also performed in the other rivers though less consistently. Only the number of new redds observed on each search were recorded.

Redd searches in the Snake River were also conducted using underwater search methods in areas too

deep to be effectively searched from the air. In 1991 and 1992, deep-water redd searches were conducted using methods developed by Swan (1989) that involved direct observation of bottom substrates by scuba divers (Connor et al. 1993; Garcia et al. 1994a). From 1993–2005, deep-water redd searches were conducted using a submersible video camera connected to a 65-ft camera cable, viewing monitor(s), and a video-recording device. The search camera was either enclosed in an aluminum sheath mounted on a 90-lb lead weight, or attached to an aluminum frame mounted between two 30-lb lead weights, and could be adjusted 45 to 90 degrees down from horizontal (Groves and Garcia, 1998). The camera was suspended from a boat using a wire rope passed through a roller on the bow, and attached to a sounding-reel/depth-indicator mounted in the boat cabin.

Underwater searches were accomplished by passing the camera over the river bottom in parallel paths spaced roughly 30 ft. apart. Distance between paths was determined by sight estimation, measuring cord laid along the shore, or GPS. The distance between the camera and river bottom, and the angle of the camera, was adjusted to maximize the amount of viewable area without losing the ability to observe details of the bottom substrates. If a redd was observed, the distance between passes in the search pattern was reduced, and in most cases, the entire area was searched at least two times in the course of the spawning season.

Camera location was recorded using electronic surveying equipment or GPS. Searches were video taped when large groups of redds were found, and the numbers of redds were verified by reviewing recorded searches while referencing plots of redd coordinates. In areas where redds overlapped and could not be identified individually, the perimeter of the redd group (or patch) was surveyed and the overall area divided by 492.5 ft<sup>2</sup>-per-redd (45.8-m<sup>2</sup>-per-redd) based on measurements of fall Chinook salmon redds in the Snake and Columbia rivers (Groves and Chandler 2001). This produced an index count of the total number of redds in the group.

Underwater searches were limited to areas greater than about 10-ft deep with a dominant bottom substrate particle size (Bovee 1982) ranging from 1- to 6-in. diameter (Raleigh et al. 1986). In 1991 and 1992, a few pilot searches were conducted at known spawning sites. From 1993 to 2002, search crews attempted to annually search about 90 areas that fit the substrate size and the depth criteria (based on Hells Canyon Dam discharged of about 9,000 cfs). From 2003 to 2005, search crews attempted to search all deep-water sites where redds were observed in previous years. However, additional searches (of new and old sites) were conducted whenever possible.

## **Results and Discussion**

### **Snake River**

In 2005, a total of 1,442 redds were counted in the Snake River (Table 1), 1,042 during nine aerial searches (Table 2), and 400 during searches of 41 deep-water sites (Tables 3 and 4). Four of the deepwater sites contained areas where large groups of redds overlapped and could not be counted individually (Table 5). Visibility ratings were reported as either “fair” or “good” during aerial searches (Table 6). The locations of all redds counted in the Snake River study area during aerial searches since 1986 are given in Appendix 2. The numbers of searches conducted in the Snake and other rivers are given in Table 7. The locations of all redds observed using submersible cameras are given in Table 8. The locations of all redds counted (aerial and underwater counts combined) in the Snake River study area since 1986 are given in Appendix 3. Redds counted in the Snake River amounted to 68% of all redds observed upriver of Lower Granite Dam in 2005, and  $59\% \pm 10\%$  from 1993–2005. The percentage of redds counted using submersible cameras from 1993–2005 averaged  $28\% \pm 9\%$  for the Snake River, and  $17\% \pm 6\%$  for all redds counted above Lower Granite Dam.



### **Clearwater River basin**

A total of 487 redds were counted in the Clearwater River in 2005 (Tables 1 and 9) during 10 aerial searches for fall Chinook salmon redds (Table 7). Observation conditions ranged from poor to excellent (Table 10). Searches were conducted in other reaches of the Clearwater and other rivers within the Clearwater Basin (Table 7), although no redds were observed. The locations of all redds counted in the Clearwater River from 1988–2005 are given in Appendix 4. Redds counted in the Clearwater River basin amounted to 23% of all redds observed upriver of Lower Granite Dam in 2005, and  $28\% \pm 6\%$  from 1993–2005.

### **Asotin Creek**

A total of six redds were observed (Tables 1 and 11) during three searches of Asotin Creek in 2005 (Table 7). Observation conditions were good on all flights (Table 12). Locations of all redds counted in Asotin Creek are given in Table 13.

### **Grande Ronde River**

A total of 129 redds were observed during nine searches of the Grande Ronde River in (Tables 1, 6, and 14). Observation conditions varied from “Poor” to “Excellent” (Table 15). Redds counted in the Grande Ronde River amounted to roughly 6% of all redds observed upriver of Lower Granite Dam in 2005, and  $11\% \pm 8\%$  from 1993–2005. The locations of all redds counted in the Grande Ronde River are given in Appendix 5.

### **Salmon River**

A total of 27 redds were observed during three searches of the Salmon River in 2005 (Tables 1, 6, and

16). Searches covered from RM 105 to the river mouth on the first and third flight, and RM 77 to the river mouth on the second flight. River discharge at RM 53.7 ranged from 3,710–4,860, and observation conditions were reported as “Fair” on the first two searches and “Excellent” on the last search. Redds counted in the Salmon River amounted to about 2% or less of all redds counted upriver of Lower Granite Dam from 1992–2005. The locations of all redds counted in the Salmon River are given in Appendix 6.

### **Imnaha River**

A total of 36 redds were observed during eight searches of the Imnaha River in 2005 (Tables 1, 6, and 17). Observation conditions were reported as “Good” to “Excellent” (Table 18). The locations of all redds counted in the Imnaha River are given in Appendix 7.

### **Escapement of adults versus redds counted**

The numbers of adult fall Chinook salmon escaping to the spawning grounds, per redds counted within (adults/redd), is routinely used as an index of redd-count accuracy. In 2005, an estimated 9,854 adults (Table 19 and Figure 2) escaped to the spawning grounds upstream of Lower Granite Dam, and we reported a total of 2,127 redds therein. Thus, the index was 4.6 adults/redd in 2005. This compares to an average of  $4.7 \pm 0.9$  adults/redd from 1993–2004.

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## **Figures and Tables**

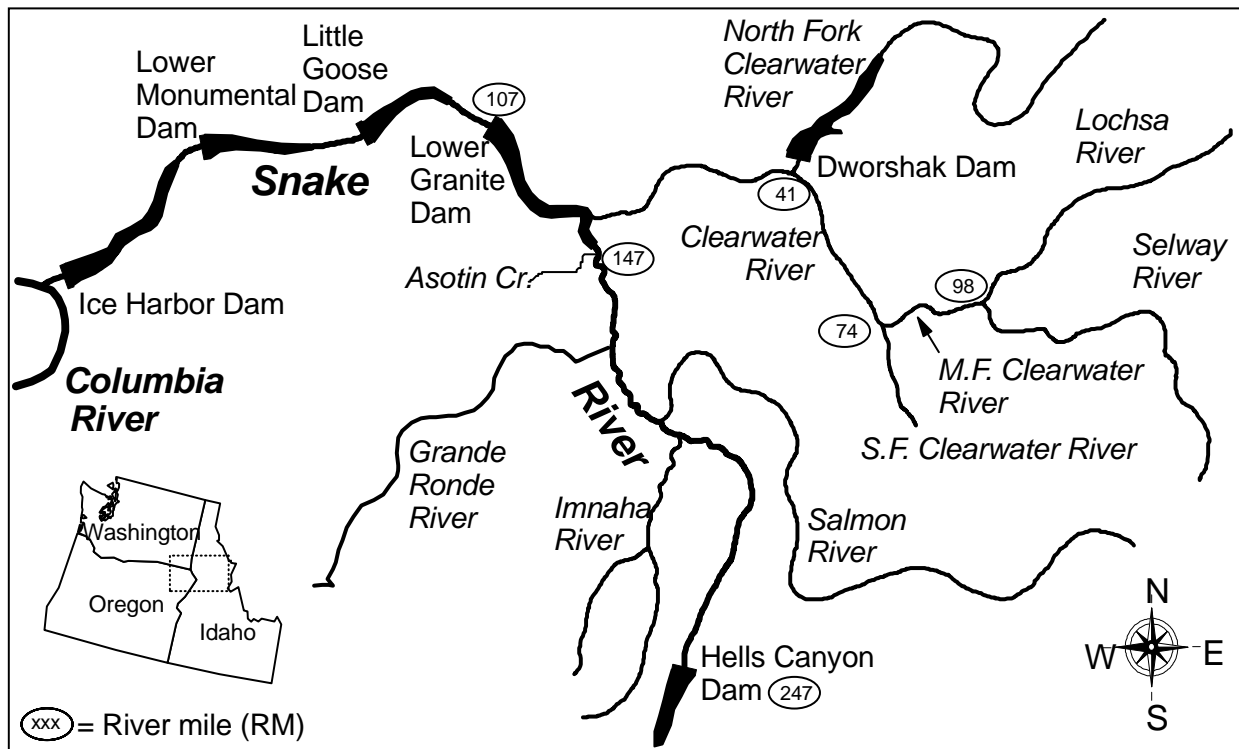


Figure 1. Map of the Snake River drainage in Oregon, Washington, and parts of Idaho.

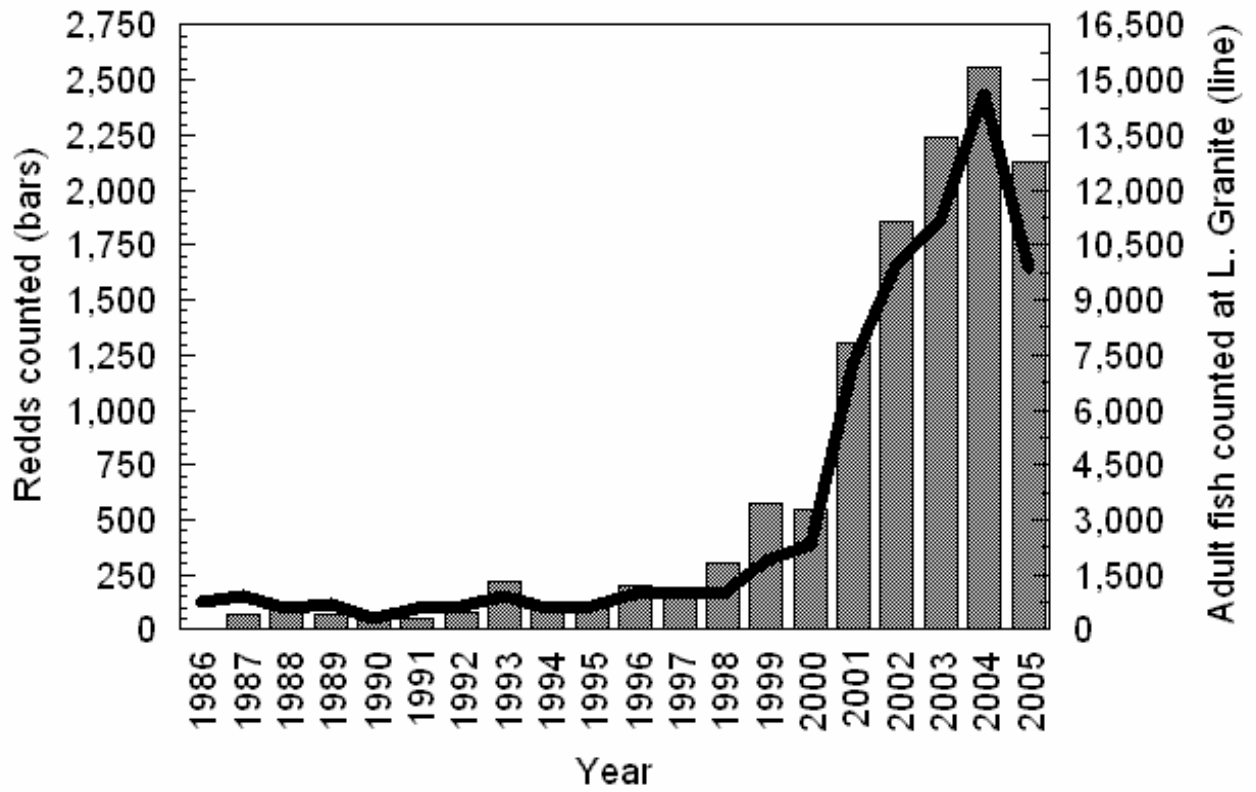


Figure 2. Number of adult fall Chinook salmon counted at Lower Granite Dam, and number of redds counted above the dam, 1986-2005 (Fish counts from USACE, and D. Milks, WDFW, unpublished data).

Table 1. Number of fall Chinook salmon redds counted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1986–2005. An empty cell indicates no searches were conducted in the corresponding river and year. Some of the data is broken down into method, and river mile (RM) sections. Data collected by the Washington Department of Fish and Wildlife, Nez Perce Tribe, Idaho Power Company, and the U.S. Fish and Wildlife Service. Abbreviations: SR=Snake River, LCR=Lower Clearwater River, NFCR=North Fork Clearwater River, UCR=Upper Clearwater River, SFCR=South Fork Clearwater River, MFCR=Middle Fork Clearwater River.

Location	Redds counted by year																			
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SR (aerial) <sup>a</sup>	7	66	64	58	37	41	47	60	53	41	71	49	135	273	255	535	878	1,118	1,218	1,042
SR (underwater)						5	0	67	14	24	33	9	50	100	91	174	235	394	491	400
LCR (RM0–41)			21	10	4	4	25	36	30	20	66	58	78	179	164	290	520	544	592	433
Potlatch River														7	0	24	3	1	1	0
NFCR <sup>b</sup>			0	0	0	0	0	0	7	0	2	14	0	1	0	1	0	8	2	0
UCR (RM 42–74)							1	0	0	0	0	0	0	2	8	16	4	19	36	54
SFCR							0	0	0	0	1	0	0	2	1	5	0	0	0	0
MFCR (RM 75–98)									0	0	0	0	0	0	0	0	0	0	0	0
Selway River									0	0	0	0	0	0	0	0	0	0	0	0
Asotin Creek				0	0	0	0											3	4	6
Grande Ronde	0	7	1	0	1	0	5	49	15	18	20	55	24	13	8	197	111	93	162	129
Salmon River							1	3	1	2	1	1	3	0	0	22	31	18	21	27
Imnaha River		0	1	1	3	4	3	4	0	4	3	3	13	9	9	38	72	43	35	36
Totals	7	73	87	69	45	54	82	219	120	109	197	189	303	586	536	1,302	1,854	2,241	2,562	2,127

<sup>a</sup> The targeted search area was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.

<sup>b</sup> Searches covered from the mouth to the Ahsahka boat ramp in 2002. Searches covered from the mouth to Dworshak Dam in previous years.

Table 2. New fall Chinook salmon redds counted during aerial and ground searches of the Snake River in 2005 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New redds counted by flight date									Totals
		18-Oct	25-Oct	31-Oct	7-Nov	15-Nov	21-Nov	28-Nov	5-Dec	12-Dec	
148.5	238.9			3	6	2	4				15
149.1	239.9		1				2				3
149.2	240.1	1	1	5	5		3				15
151.9	244.4						2				2
152.1	244.7						9				9
152.3	245.1		1	1	12	10	20*	1			45
155.9	250.8						1				1
158.0	254.2			3			6	4			13
159.6	256.8		1								1
160.5	258.2			2							2
161.0	259.0		7	4	3		5				19
162.4	261.3			2	1	5	4	2	1		15
164.7	265.0		3	4	2						9
165.3	266.0		6	6				2			14
165.8	266.8		14	26	23	20	1	8	3		95
166.2	267.4				2	3					5
167.9	270.2								1	1	2
168.6	271.3						1				1
168.7	271.4		1	14		22		5	4		46
169.7	273.0			4				2	1		7
172.5	277.6			1					1		2
175.9	283.0				1			1			2
176.7	284.3			1							1
178.9	287.9		5						2		7
179.6	289.0		9	5	5	2		7			28
181.7	292.4		2	1		3					6
182.3	293.3			2		1			7		10
183.5	295.3					1		1			2
188.2	302.8		1	1				1			3
189.9	305.5			1							1
190.2	306.0				1				1		2

Table 2 (Continued)

New fall Chinook salmon redds counted during aerial searches of the Snake River in 2005 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New counted by flight date									Totals
		18-Oct	25-Oct	31-Oct	7-Nov	15-Nov	21-Nov	28-Nov	5-Dec	12-Dec	
190.8	307.0					2	2				4
191.1	307.5			1							1
191.6	308.3				2						2
191.7	308.4					1					1
193.6	311.5					3					3
193.7	311.7				1	1					2
194.0	312.1	1	4	10	5		1				21
194.1	312.3		3				1				4
195.7	314.9						3	4			7
196.0	315.4		2	8	7	6	3				26
198.2	318.9		2	14	10						26
198.8	319.9	1	3	9	14						27
205.3	330.3		1	5	10						16
205.4	330.5		1	1							2
205.7	331.0			1							1
206.5	332.3		1	4	3						8
206.6	332.4		1	1							2
207.5	333.9				1						1
207.8	334.4			2	2	1					5
208.0	334.7		8	17	6	6					37
208.3	335.2			1							1
211.9	340.9		3	5	12						20
212.3	341.6			1		1	1				3
213.3	343.2		1	2	1	3					7
213.6	343.7			1	1	2	1				5
213.7	343.8		1	2							3
214.5	345.1			3	3						6
215.4	346.6		2	2	2						6

Table 2 (Continued)

New fall Chinook salmon redds counted during aerial searches of the Snake River in 2005 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	New counted by flight date								Totals	
		18-Oct	25-Oct	31-Oct	7-Nov	15-Nov	21-Nov	28-Nov	5-Dec		12-Dec
216.1	347.7		2	3	2	2					9
216.9	349.0			11	10	2	5				28
217.3	349.6			15	12	4	2	2			35
218.1	350.9			1							1
218.5	351.6		2	1			6	9			18
218.7	351.9			6	4	1					11
219.0	352.4				6		1				7
219.3	352.9			6	6	1					13
222.7	358.3			2			1				3
222.9	358.6		3	3	6	5					17
223.3	359.3		1								1
224.7	361.5			3	4						7
225.0	362.0			1							1
225.1	362.2			1							1
227.5	366.0			-			3				3
231.3	372.2			-	2						2
235.0	378.1		4	-	8						12
235.6	379.1			-			2				2
235.7	379.2	1	2	-	20	8	2				33
236.0	379.7			-	6						6
236.1	379.9			-	2						2
237.0	381.3		1	-	19	3					23
238.4	383.6			-	1						1
238.6	383.9		3	-	13	3		2			21
240.4	386.8		2	-	10	4					16
240.6	387.1	3	4	-	21	4					32
240.7	387.3			-	1						1
241.0	387.8			-		6					6

Table 2 (Continued)

New fall Chinook salmon redds counted during aerial searches of the Snake River in 2005 (Data collected by Idaho Power Company and the U.S. Fish and Wildlife Service). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.											
RM	RK	New counted by flight date									Totals
		18-Oct	25-Oct	31-Oct	7-Nov	15-Nov	21-Nov	28-Nov	5-Dec	12-Dec	
242.3	389.9			-	2	2					4
242.8	390.7	1	5	-	4	2	5				17
243.2	391.3		2	-	8	4					14
243.8	392.3			-		1					1
244.0	392.6		2	-	3	3			1		9
244.5	393.4		3	-	13	12	1				29
244.7	393.7			-	2						2
245.5	395.0			-	5	5					10
245.7	395.3			-		2					2
245.8	395.5		1	-	8						9
246.0	395.8		1	-							1
247.5	398.2			-		2					2
		8	123	229	339	171	78	51	22	1	1,042

\* Count includes 20 redds observed from the ground. These redds were shallow (i.e., in <10 ft of water), but were not seen during aerial searches.



Table 3. Record of fall Chinook salmon redds counted in the Snake River using submersible cameras in 2005 (Data collected by the Idaho Power Company and U.S. Fish and Wildlife Service). Counts are presented by river mile (RM) and river kilometer (RK). In 2005, 78 individual redds were counted in deep water at RM 179.6, and one at RM 193.0, RM 208.0, and RM 212.2. We measured 990 m<sup>2</sup> of disturbed bottom substrates at RM 179.6, 900 m<sup>2</sup> at RM 193.0, 620 m<sup>2</sup> at RM 208.0, and 1,270 m<sup>2</sup> at RM 212.2, equaling 22, 20, 14, and 28, redds, respectively, using a conversion factor of 45.8 m<sup>2</sup> -per-redd.

RM	RK	Redds
158.0	254.2	6
162.4	261.3	1
163.7	263.4	5
165.7	266.6	12
166.2	267.4	3
166.6	268.1	21
168.7	271.4	21
169.7	273.0	15
179.6	289.0	100
184.7	297.2	9
188.2	302.8	2
193.0	310.5	21
193.7	311.7	2
194.4	312.8	13
195.7	314.9	10
198.2	318.9	7
198.8	319.9	2
208.0	334.7	15
212.2	341.4	29
212.3	341.6	4
213.3	343.2	2
216.9	349.0	8
218.5	351.6	48
218.7	351.9	7
235.0	378.1	28
236.3	380.2	1
242.8	390.7	8
		400

Table 4. List of the 41 sites searched for fall Chinook salmon redds in the Snake River, 2005, by river mile (RM).

RM searched	RM searched
145.0	194.4
148.2	195.7
148.5	198.2
156.4	198.8
158.0	199.4
162.4	208.0
163.7	208.3
165.7	212.2
166.2	212.3
166.6	213.3
168.7	216.9
169.6	218.5
179.6	218.7
184.7	221.0
188.2	223.1
193.0	235.1
193.4	236.2
193.5	237.0
193.7	242.2
193.8	242.9
194.1	

Table 5. Area (m<sup>2</sup>) containing overlapping redds in the Snake River, 1995–2005, by river mile.

Year	Area (m <sup>2</sup> ) by river mile				
	158.0	179.6	193.0	208.0	212.2
1995		170			
1996		238			
2001		1,226			
2002		1,282			
2003		1,122			1,184
2004	1,259	1,479	981		1,257
2005		990	900	620	1,270

Table 6. Flight information, river flow, and visibility ration for aerial surveys of the Snake River in 2005.

Category	Flight information by flight date								
	18-Oct	25-Oct	31-Oct	7-Nov	15-Nov	21-Nov	28-Nov	5-Dec	12-Dec
River Mile Start	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0	144.0
River Mile End	247.5	247.5	227	247.5	247.5	247.5	247.5	247.5	247.5
Aircraft	Hughes 500	Hughes 500	Hughes 500	Hughes 500	Hughes 500	Hughes 500	Hughes 500	Hughes 500	Jet Ranger
Pilot	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.	K. White
Observer 1	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves	P. Groves
Observer 2	J. Kaufman	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury	S. Bradbury
Observer 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Weather	Clear	Clear	Cldy/Rain	Cldy/Rain	Ptly Cldy	Cldy/Fog	Clear	Ptly Cldy	Clear
Flow (c.f.s.) at RM 67.5	13,300	13,000	13,400	14,700	15,800	14,500	14,900	13,400	11,900
Flow (c.f.s.) at RM 247.0	8,717	8,716	8,710	9,001	10,122	10,142	9,510	8,765	8,740
Visibility rating (VR): Asotin to Grande Ronde River	Good	Good	Good	Good	Fair	Good	Good	Good	Good
VR: Grande Ronde River to Salmon River	Good	Good	Good	Good	Fair	Good	Good	Good	Good
VR: Salmon River to Hells Canyon Dam	Good	Good	Good	Good	Good	Good	Good	Good	Good

Table 7. Number of redd searches conducted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1986–2005. Data for underwater searches indicates the number of discrete patches of gravels searched, whereas all other data indicates the number of helicopter flights over portions of the corresponding river.

Location	Redd searches by year																			
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Snake (helicopter)	1	2	2	2	3	9	8	8	8	7	7	8	8	9	9	10	7	7	8	9
Snake (camera)						1	3	50	73	42	32	63	48	73	60	67	60	47	67	41
Lower Clearwater (RM 0–41)			1	2	2	2	2	5	5	3	4	9	5	10	11	8	9	9	10	10
Potlatch River <sup>a</sup>														1	5	3	3	2	3	0
N.F. Clearwater							2	4	5	3	5	9	5	7	11	4	9	9	10	10
Clearwater River (RM 42–74)							2	4	5	2	1	7	5	8	11	4	3	9	2	3
S.F. Clearwater							2	4	4	1	3	7	5	8	6	7	3	3	2	1
M.F. Clearwater (RM 75–98)									1	2	2	2	5	3	4	5	1	1	0	1
Selway River									1	2	2	2	5	3	5	6	1	1	0	2
Asotin Creek			1	1	2	1												2	2	3
Grande Ronde	1	3	2	1	1	3	6	8	7	3	4	8	6	7	7	9	7	8	8	9
Salmon River							2	3	3	1	4	3	3	3	2	1	2	3	3	3
Imnaha River		1	2	2	1	9	6	8	8	6	5	7	6	9	9	9	7	8	8	8

<sup>a</sup> Fall Chinook salmon redds were observed in the Potlatch River in 2002–2004 during air and (or) ground searches for coho redds and carcasses.

Table 8. Numbers of fall Chinook salmon redds counted using submersible cameras in the Snake River, 1991-2005. Counts are presented by river mile (RM) and river kilometer (RK). A zero indicates the site was searched but no redds were observed. An empty cell indicates the site was not searched in the corresponding year.

RM	RK	Redds counted by year														
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
148.5	238.9			0	0		0	0		0	0	1	3		8	0
155.0	249.4														2	
156.4	251.6												18	0		0
158.0	254.2			0	0		0	0	0	0	0	0	1	4	30	6
162.4	261.3	5	0	0	0		2	0	0	0	0	6	1	0		1
163.7	263.4				0		0	0		0	0	0	0	10	9	5
165.3	266.0			0	0							4	0			
165.7	266.6			28	0		0	0	0	0	0	6	8	48	13	12
166.2	267.4			11	0		0	0	0	0	0	0	1	0		3
166.6	268.1			21	0		0	0	6	0	1	0	9	1	8	21
168.7	271.4													28	24	21
169.7	273.0			0	0		0	0						10	17	15
178.5	287.2													25		
179.6	289.0			2	8	19	24	5	16	30	48	67	75	94	82	100
181.8	292.5			0	0			0		1		0	0		5	
183.1	294.6			0	0			0	0	2	0	0	4		1	
183.5	295.3			0											9	
184.7	297.2			0	0			0		0	0	0	0	6	1	9
188.2	302.8									0	0	2	0	3	1	2
193.0	310.5												21	16	22	21
193.4	311.2			0											1	0
193.6	311.5			0	0	0	0	0	0	0	0	4	2		3	0
193.7	311.7		0		0	0	0	0	0	0	0	1	1		2	2
193.8	311.8			1	0	0	0	0	0	0	0	0	1		2	0
194.1	312.3				5	0	0	0	0			0	0		5	0
194.4	312.8				0	0		0		0	0	0	1	5	23	13
195.7	314.9															10
198.2	318.9				0	0	2	0	0	6	5	19	11	13	18	7
198.8	319.9				0	0	0	0	0	4	4	2	2	4	12	2
199.4	320.8			1	0	0	5	0	0	2	1	2	0	0	1	0
203.1	326.8			0	0	0	0	0	10	0	0	0	0	2		
208.0	334.7			0	0	0	0	4	0	11	0	0	1	14	5	15
208.3	335.2			0	0	0	0	0	0	4	0	4	0	0		0
211.9	340.9			0						1				0		
212.2	341.4			0	0	2	0	0	17	24	28	37	37	33	27	29
212.3	341.6					0			0	2	3	8	5	2	8	4
213.3	343.2			0	0	0		0	0	0	0	4	8	8	6	2
216.9	349.0									4	0	1		2	23	8
218.5	351.6									0	1	0	11	1	37	48

Table 8 (Continued)

Numbers of fall Chinook salmon redds counted using submersible cameras in the Snake River, 1991-2005. Counts are presented by river mile (RM) and river kilometer (RK). A zero indicates the site was searched but no redds were observed. An empty cell indicates the site was not searched in the corresponding year.

RM	RK	Redds counted by year														
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
218.7	351.9					3		0	0	1		4	2	0	3	7
219.0	352.4									1			0			
219.3	352.9														4	
221.0	355.6									0	0	0	1	0		0
222.3	357.7			0	0	0		0	0	0	0	0	0	0	6	
222.8	358.5			3	0	0				0	0			0	2	
223.1	359.0									3	0	0				0
228.0	366.9				0	0	0	0	0	2	0	0	0	1		
224.7	361.5														3	
228.7	368.0				0	0		0		0					3	
235.0	378.1				0	0			0		0		9	56	48	28
235.7	379.2			0		0	0	0	0					0	2	
236.0	379.7			0	0										1	
236.3	380.2				0										1	1
236.9	381.2			0	1	0	0	0	0				0			0
237.0	381.3			0	0	0	0	0	0				0		2	
239.4	385.2													6		
242.9	390.8								1	2		1	2	2	11	8
245.8	395.5					0				0		1				
		5	0	67	14	24	33	9	50	100	91	174	235	394	491	400

Table 9. New fall Chinook salmon redds counted in the Clearwater River in 2005. Counts are presented by river mile (RM), river kilometer (RK), and flight date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile (Data collected by the Nez Perce Tribe).

RM	RK	New redds counted by flight date										Totals
		22-Sep	3-Oct	10-Oct	17-Oct	24-Oct	27-Oct	10-Nov	16-Nov	21-Nov	28-Nov	
17.3	27.8							3				3
18.0	29.0			4	2	1		9	22			38
19.1	30.7			1	1	4		3				9
19.3	31.1							5	2			7
21.0	33.8					1		2				3
21.7	34.9				1				5			6
22.0	35.4			8	18	39		66	8			139
22.2	35.7					5		22	4			31
23.3	37.5					11		25				36
26.5	42.6					9						9
27.5	44.2					6						6
28.4	45.7				11	4		5				20
32.5	52.3							8	2			10
34.0	54.7			6	10	2			8			26
35.4	57.0			2	6	5		3	9			25
36.2	58.2					3		1	12			16
39.6	63.7					1						1
40.3	64.8							26	22			48
43.2	69.5								6			6
45.0	72.4					3			5			8
51.5	82.9	-	-	-	1	-	2					3
51.7	83.2	-	-	-		-	1					1
52.2	84.0	-	-	-		-	3		2			5
52.5	84.5	-	-	-		-	2		1			3
52.8	85.0	-	-	-		-	4					4
53.8	86.6	-	-	-	1	-	3	6				10
58.2	93.6	-	-	-		-	2	-		-	-	2
66.0	106.2	-	-	-	5	-	3	-		-	-	8
68.0	109.4	-	-	-		-	4	-		-	-	4
		0	0	21	56	94	24	184	108	0	0	487

Table 10. Flight information, river flow, and visibility rating for aerial redd surveys of the Clearwater River in 2005 (Data provided by the Nez Perce Tribe).

Category	Flight information by flight date									
	22-Sep	23-Oct	10-Oct	17-Oct	24-Oct	27-Oct	10-Nov	16-Nov	21-Nov	28-Nov
River Mile Start	4	4	4	4	4	45	4	4	7	4
River Mile End	45	45	45	75	45	75	54	75	54	54
Flow at Spalding Gauge	2,754	4,310	2,940	2,810	2,870	2,780	3,700	3,790	3,350	3,790
Flow on North Fork	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Flow at Orofino Gauge	1,060	2,470	1,360	1,210	1,270	1,280	1,950	1,860	1,680	2,040
Observation Conditions	Excel	Poor	Good	Good	Good	Good	Poor	Poor	Poor	Poor

Table 11. New fall Chinook salmon redds counted in Asotin Creek in 2005. Counts are presented by river mile (RM), river kilometer (RK), latitude/longitude, and flight date. An empty cell indicates no redds were observed on the corresponding location and date. A dash indicates no search was conducted at the corresponding river mile.

RM	RK	Latitude / Longitude	New redds counted by flight date			Total
			17-Oct	15-Nov	5-Dec	
0.2	0.3	N 46° 20' 26.014", W 117° 3' 18.044"	0	0	1	1
1.0	1.6	N 46° 20' 26.494", W 117° 3' 55.544"	0	1	0	1
1.3	2.1	N 46° 19' 59.376", W 117° 4' 10.182"	0	1	0	1
1.7	2.7	N 46° 19' 50.675", W 117° 4' 41.981"	0	2	0	2
1.8	2.9	N 46° 19' 51.035", W 117° 4' 44.562"	0	1	0	1
Total Redd Count			0	5	1	6

Table 12. Flight information, river flow, and visibility rating for aerial redd surveys of Asotin Creek in 2005.

Category	Flight information by date		
	17-Oct	15-Nov	5-Dec
River Mile Start	0	0	0
River Mile End	5.0	5.0	5.0
Aircraft	Hughes 500	Hughes 500	Hughes 500
Pilot	J. Pope Jr.	J. Pope Jr.	J. Pope Jr.
Observer 1	P. Groves	S. Bradbury	S. Bradbury
Observer 2	J. Kaufman	N/A	K. Mayer
Weather	Clear	Ptly Cldy	Ptly Cldy
Observation Rating	Good	Good	Good



Table 13. Fall Chinook salmon redds counted in Asotin Creek during aerial searches, by latitude/longitude, and year (2003–2005). An empty cell indicates no redds were observed at the corresponding location and year.

RM	RK	Latitude / Longitude	Year		
			2003	2004	2005
0.2	0.3	N 46° 20' 24.814", W 117° 3' 17.806"	1		
0.2	0.3	N 46° 20' 26.014", W 117° 3' 18.044"			1
0.5	0.8	N 46° 20' 16.062", W 117° 3' 30.532"		1	
1.0	1.6	N 46° 20' 2.098", W 117° 3' 59.566"	1		
1.0	1.6	N 46° 20' 3.703", W 117° 3' 53.687"		3	
1.0	1.6	N 46° 20' 2.947", W 117° 3' 55.947"			1
1.3	2.1	N 46° 19' 59.376", W 117° 4' 10.182"			1
1.7	2.7	N 46° 19' 50.675", W 117° 4' 41.981"			2
1.8	2.9	N 46° 19' 51.035", W 117° 4' 44.562"			1
12.5	20.1	N 46° 17' 35.448", W 117° 16' 24.622"	1		
			3	4	6

Table 14. New fall Chinook salmon redds counted during aerial searches of the Grande Ronde River in 2005 (Data collected by the Nez Perce Tribe). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redd were observed on the corresponding location. A dash indicates no survey was conducted over the corresponding river mile.

RM	RK	New Redds Counted by Flight Date									Totals
		4-Oct	11-Oct	18-Oct	25-Oct	3-Nov	8-Nov	14-Nov	22-Nov	30-Nov	
0.6	1.0					1	8	8	1		18
1.7	2.7				1	1	4	3	1	1	11
2.0	3.2					9	9	15			33
3.3	5.3						1				1
3.6	5.8						2	1			3
3.7	6.0					2	4	7	1	2	16
4.3	6.9						2	1			3
4.4	7.1				1		2				3
4.6	7.4								3	1	4
8.2	13.2						1				1
10.0	16.1				2	1					3
10.5	16.9				1	1	2	2	1		7
12.7	20.4							1			1
13.8	22.2						3	1			4
15.2	24.5			1							1
17.7	28.5						2	2			4
20.1	32.3									1	1
21.0	33.8						1				1
22.1	35.6						1				1
33.4	53.7			1	1						2
37.6	60.5				1		2				3
37.7	60.7						1				1
37.9	61.0		1								1
38.4	61.8				1						1
44.2	71.1						1				1
44.5	71.6						1				1
44.9	72.2			1							1
45.5	73.2						1				1
47.7	76.7			1							1
		0	1	4	8	15	48	41	7	5	129

Table 15. Flight information, river discharge, and visibility rating for aerial redd surveys of the Grande Ronde River in 2005. All surveys were conducted from a Jet Ranger helicopter. Flights conducted by NPT.

Category	Flight information by flight date								
	4-Oct	11-Oct	18-Oct	25-Oct	3-Nov	8-Nov	14-Nov	22-Nov	30-Nov
River Mile Start	0	0	0	0	0	0	0	0	0
River Mile End	52.7	52.7	52.7	52.7	52.7	52.7	52.7	52.7	52.7
Flow (cfs) at Troy Gauge	682	664	603	595	803	806	855	691	711
Observation Conditions	Fair	Fair	Exc	Exc	Poor	Good	Good	Exc	Good

Table 16. Fall Chinook aerial spawning ground surveys conducted in the Salmon River, 2005 (Data collected by the Nez Perce Tribe). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no redd were found on the corresponding location and date.

RM	RK	New redds counted by flight date			Totals
		26-Oct	9-Nov	28-Nov	
3.9	6.3			4	4
5.3	8.5		2		2
12.1	19.5		1		1
14.3	23.0		5		5
15.3	24.6			2	2
30.8	49.6			10	10
31.0	49.9	3			3
		3	8	16	27

Table 17. New fall Chinook salmon redds counted during aerial searches of the Imnaha River in 2005 (Data collected by the Nez Perce Tribe). Counts are presented by river mile (RM), river kilometer (RK), and date. An empty cell indicates no survey was conducted over the corresponding river mile.

RM	RK	New redds counted by flight date								Totals
		4-Oct	11-Oct	18-Oct	25-Oct	3-Nov	8-Nov	14-Nov	30-Nov	
0.4	0.6					1		3		4
0.5	0.8					1	1	2		4
0.8	1.3				1					1
1.0	1.6					1				1
1.7	2.7				1	1				2
2.4	3.9				2			1		3
3.2	5.1					1		1		2
3.4	5.5							1		1
3.5	5.6					2				2
3.8	6.1				1	1				2
4.0	6.4							1	1	2
4.1	6.6				1	1				2
5.3	8.5						1			1
7.0	11.3				1					1
7.7	12.4						1			1
7.8	12.6					2				2
7.9	12.7						1			1
8.9	14.3			1						1
9.8	15.8							1		1
9.9	15.9							1		1
13.4	21.6						1			1
		0	0	1	7	11	5	11	1	36

Table 18. Flight information, river flow, and visibility rating for aerial redd surveys of the Imnaha River in 2005.

Category	Flight date							
	4-Oct	11-Oct	18-Oct	25-Oct	3-Nov	8-Nov	14-Nov	30-Nov
River Mile Start	0	0	0	0	0	0	0	0
River Mile End	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Flow (cfs) at Imnaha Gauge	118	102	124	120	160	157	170	156
General Observation Conditions	Exc	Good	Exc	Exc	Exc	Good	Good	Exc

Table 19. Annual count of adult fall Chinook salmon in the Lower Granite Dam fish ladder (Raw count), the number removed (Adult take), the number estimated to have passed the dam (Adults passed), the number of redds counted upstream of the dam, and number of adult fall Chinook salmon counted per redd counted upstream (adults/redd), 1986–2005. Raw counts are from USACE (e.g., USACE 1986–2005), and values for adult take are from the Washington Department of Fish and Wildlife (D. Milks, personal communication).

Year	Raw count	Adult take	Adults passed	Redds counted upstream	Adults/redd
1986	784	13	771	7	110.1
1987	951	3	948	73	13.0
1988	627	2	625	87	7.2
1989	706	0	706	69	10.2
1990	385	50	335	45	7.4
1991	630	40	590	54	10.9
1992	855	187	668	82	8.1
1993	1,170	218	952	219	4.3
1994	791	185	606	120	5.1
1995	1,067	432	635	109	5.8
1996	1,308	389	919	197	4.7
1997	1,451	444	1,007	189	5.3
1998	1,909	947	962	303	3.2
1999	3,381	1,519	1,862	579	3.2
2000	3,696	1,470	2,226	543	4.1
2001	8,915	2,286	6,629	1,302	5.1
2002	12,351	2,404	9,947	1,854	5.4
2003	11,732	489	11,243	2,241	5.0
2004	14,960	466	14,494	2,562	5.7
2005	11,194	1,340	9,854	2,127	4.6

## **Appendices**

## Appendix 1

Redd counts recorded from 1959 to 1978 in the Snake River between Lewiston, Idaho, and the Hells Canyon Dam site.

River section	Citation	Year											
		1959	1960	-	1967	-	1969	-	1974	1975	1976	-	1978
Hells Canyon Dam to Pleasant Valley Dam Site	Irving and Bjornn 1981	19	2		144		294						
Pleasant Valley Dam Site to Imnaha River	Irving and Bjornn 1981	7	2		11		94						
Imnaha River to Lewiston, ID	Irving and Bjornn 1981	2	0		33		180						
		<b>28</b>	<b>4</b>		<b>188</b>		<b>568</b>						
Hells Canyon Dam to Johnson Bar	Witty 1988						170		1	N.D.	8		
Johnson Bar to Pleasant Valley	Witty 1988						124		10	N.D.	1		
Pleasant Valley to Appaloosa	Witty 1988						61		3	N.D.	0		
Appaloosa to Mountain Sheep	Witty 1988						33		2	N.D.	4		
Mountain Sheep to State Line	Witty 1988						0		0	N.D.	0		
							<b>388</b>		<b>16</b>	<b>10</b>	<b>13</b>		
Hells Canyon Dam to Asotin, Washington	Groves and Chandler 1996												<b>132</b>
Maximum annual count		<b>28</b>	<b>4</b>	-	<b>188</b>	-	<b>568</b>	-	<b>16</b>	<b>10</b>	<b>13</b>	-	<b>132</b>

## Appendix 2

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986–2005).  
An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
148.0	238.1																	5			
148.3	238.6					1													1		
148.5	238.9															5	3	34	22	59	15
148.8	239.4				1													2	4		
149.1	239.9				1		2		1					2	1		2	13			3
149.2	240.1																4		15		15
149.4	240.4																		1	9	
149.6	240.7																			2	
150.0	241.4																	1			
151.5	243.8								2						1		5		4	3	
151.9	244.4			1							3	4	8					7	31	26	2
152.1	244.7																1		6		9
152.3	245.1		13	15	23	16		7	3	5		3	12	3	20	21	52	23	19	46	45
152.4	245.2																			2	
152.8	245.9																			1	
153.2	246.5																	4	1	5	
155.0	249.4																			13	
155.2	249.7																	1			
155.9	250.8																			11	1
156.4	251.6																			10	
156.6	252.0																	28			
156.8	252.3															1	3				
156.9	252.5				1																
157.2	252.9					1															
157.4	253.3	2																			
157.6	253.6												1	3				1	2	1	
158.0	254.2																1	1	9	25	13
159.3	256.3																1		1		
159.6	256.8																1		2		1



### Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
159.7	257.0							3										3	1	1	
160.5	258.2																1		2		2
160.8	258.7															1					
161.0	259.0							7	11		3		7	9	1	7	12	11	20	16	19
161.8	260.3																1				
162.4	261.3			2	1	2	15	11	1						1	4	50	32	2	27	15
163.0	262.3		3																		
163.3	262.7					2															
163.7	263.4																		14	5	
164.4	264.5		2																		
164.7	265.0				2	1				1			1				19	12	25	28	9
165.2	265.8			5					2	3							1				
165.3	266.0								2					1				7	19	27	14
165.5	266.3		4																		
165.8	266.8														5			44	69	60	95
165.9	266.9		2	14			1	3	9			3		2			32				
166.2	267.4								6											1	5
166.5	267.9						6														
167.9	270.2																	1			2
168.1	270.5																	1			
168.6	271.3																	1	8		1
168.7	271.4								5	6	3						7	47	62	48	46
169.7	273.0				1						1	1						11	21	6	7
169.9	273.4																		1		
171.9	276.6																			1	
172.5	277.6		1									3		4	1	1	18	11	1	11	2
173.9	279.8		1													1	1		2	9	

### Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
175.2	281.9																2				
175.7	282.7																	1	1		
175.9	283.0																			4	2
176.5	284.0									1						2	1		2		
176.7	284.3																			7	1
177.9	286.2																			1	
178.3	286.9									1										10	
178.5	287.2															2			13	1	
178.9	287.9				1					1				2	7	13	3	18	10	11	7
179.5	288.8																			6	
179.6	289.0								4	5	2	8			10	8	5	17	16	17	28
181.7	292.4															1	1	3	9	10	6
182.3	293.3																		8		10
183.1	294.6																			1	
183.4	295.1																		1	8	
183.5	295.3																		11		2
186.7	300.4																	3			
187.5	301.7																1	1			
187.7	302.0																1		7	3	
188.2	302.8														1	2	5	1		1	3
189.9	305.5																				1
190.0	305.7										1								1	1	
190.2	306.0									1							2	5	3	2	2
190.7	306.8																		3		
190.8	307.0		1	5		2	5	1				1		4	2	5	18	28	6	17	4
191	307.3																		2	2	
191.1	307.5																			1	1

### Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
191.6	308.3																				2
191.7	308.4	2	2	4											1		3	10	11	6	1
193.0	310.5																	7	2		
193.2	310.9																		1		
193.4	311.2				5	2				2		2	1	4			2	3	3		
193.6	311.5																	1	9	3	3
193.7	311.7		4					6	1	2	1		2	3	1	5	7	7		9	2
193.8	311.8									1	1					2	1			1	
194.0	312.1		2			3			1	2	4	2	6	14	11	11	22	26	20	21	21
194.1	312.3			2		2											1		1	1	4
195.7	314.9																				7
196.0	315.4			3						2				1	6	10	20	23	34	29	26
196.2	315.7		1																		
198.2	318.9													1	11	9	17	22	25	17	26
198.8	319.9		5		3	2	7	3		6	1	6		4	11	13	19	23	35	31	27
201.1	323.6														1	1	2	3	6	4	
203.1	326.8																	1	8		
204.1	328.4		1																		
205.3	330.3						3				1			3	6	2		11	17	12	16
205.4	330.5		1									2				4		2	4	5	2
205.7	331.0																		2		1
206.5	332.3		1	4			1	2	1		2			2	4		2	2	10	15	8
206.6	332.4														2			1	5	2	2
207.5	333.9																	3	3	1	1
207.7	334.2														2	1					
207.8	334.4			1								3	2		5			1	3	4	5
207.9	334.5			2																	

### Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
208.0	334.7			1							2	9	1	13	25	17	22	36	48	46	37
208.1	334.8																	1			
208.3	335.2																				1
209.1	336.4														1			1			
209.7	337.4		1												1			2			
210.8	339.2																		1		
211.9	340.9								2					11	9	6	14	25	30	28	20
212.2	341.4																		1		
212.3	341.6																1	4	2	4	3
213.3	343.2				2							1				1	2	1	4		7
213.6	343.7											1			2	1	2	4	6	5	5
213.7	343.8					1		2						4	1	1	6	7	1	13	3
213.9	344.2																			2	
214.5	345.1								1								1	4	3	7	6
214.7	345.5		2																3		
215.4	346.6													1	2				6	3	6
216.1	347.7									1				3	1	2	6	4		9	9
216.9	349.0															5	6	21	21	30	28
217.3	349.6							1	3		1			4	24	6	13	22	42	36	35
217.8	350.4				1														2		
218.1	350.9																				1
218.2	351.1		1																		
218.5	351.6														3	2		5	10	10	18
218.7	351.9										1	7		4	12	5	11	15	20	13	11
219.0	352.4										3	2		4	4	6	3	11	7	12	7
219.3	352.9			2				1		3		2	3	6	8	5	7	13	12	13	13
220.7	355.1																		4	1	

### Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
221.5	356.4																1				
222.3	357.7																	2			
222.7	358.3				1										6		1		8	14	3
222.8	358.5	2	3													5					
222.9	358.6				3					1					9		4	20	19	21	17
223.2	359.1									3	3							1			
223.3	359.3																				1
223.7	359.9			1																	
224.7	361.5													3					12	12	7
225.0	362.0														2		8	2		1	1
225.1	362.2														2				3		1
226.7	364.8														3			1			
227.5	366.0																				3
231.3	372.2																	1	1	2	2
235.0	378.1										1			1	2	3		12	10	9	12
235.6	379.1																				2
235.7	379.2		4		3					5	2	7	1	4	11	16	16	22	16	23	33
236.0	379.7	1														1		1	2	2	6
236.1	379.9		1	2	1										2	1	1			2	2
236.7	380.9		1																		
237.0	381.3								5	2	1		2	8	6	13	14	26	20	24	23
238.1	383.1																			1	
238.4	383.6														1	1		2	1		1
238.6	383.9		2		2						1				4	4	8	13	23	16	21
240.4	386.8																	11	11	15	16
240.6	387.1		6									1		2	8	1	3			36	32

### Appendix 2 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Numbers of fall Chinook salmon redds counted by year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
240.7	387.3				3		6					1	1	4	7	11	13	21	24		1
241.0	387.8												1				4	5	8	8	6
242.3	389.9																				4
242.8	390.7															4	3	7	11	10	17
243.2	391.3																				14
243.3	391.5		1		1											4					
243.5	391.8											2		1			5		13	12	
243.8	392.3																	2	2	1	
244.0	392.6														2			12		8	9
244.3	393.1																	2			
244.5	393.4				1	2									1	2	9	13	31	25	29
244.7	393.7																		2	1	2
245.2	394.5																			1	
245.3	394.7														1		1		9	7	
245.5	395.0																				10
245.7	395.3										2								2	6	2
245.8	395.5														2			4	6	9	9
246.0	395.8																				1
246.5	396.6				1																
247.5	398.2																		4	2	2
		7	66	64	58	37	46	47	60	53	41	71	49	135	273	255	535	878	1,118	1,218	1,042

### Appendix 3

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986–2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
148.0	238.1																	5			
148.3	238.6					1													1		
148.5	238.9															5	4	37	22	67	15
148.8	239.4				1																
148.9	239.6																	2	4		
149.1	239.9				1		2		1					2	1		2				3
149.2	240.1																4	13	15		15
149.4	240.4																		1	9	
149.6	240.7																			2	
150.0	241.4																	1			
151.5	243.8								2								5		4	3	
151.9	244.4			1							3	4	8		1			7	31	26	2
152.1	244.7																1		6		9
152.3	245.1		13	15	23	16		7	3	5		3	12	3	20	21	52	23	19	46	45
152.4	245.2																			2	
152.8	245.9																			1	
153.2	246.5																	4	1	5	
155.0	249.4																			15	
155.2	249.7																	1			
155.9	250.8																			11	1
156.4	251.6																	18		10	
156.6	252.0																	28			
156.8	252.3															1	3				
156.9	252.5				1																
157.2	252.9					1															
157.4	253.3	2																			
157.6	253.6												1	3				1	2	1	
158.0	254.2																1	2	13	55	19
159.3	256.3																1		1		

### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
159.5	256.6																1		2		
159.7	257.0							3										3	1	1	1
160.5	258.2																1		2		2
160.8	258.7															1					
161.0	259.0							7	11		3		7	9	1	7	12	11	20	16	19
161.8	260.3																1				
162.4	261.3			2	1	2	20	11	1			2			1	4	56	33	2	27	16
163.0	262.3		3																		
163.3	262.7					2															
163.7	263.4																		24	14	5
164.4	264.5		2																		
164.7	265.0				2	1				1			1				19	12	25	28	9
165.2	265.8			5					2	3							5				
165.3	266.0								2					1				7	19	27	14
165.5	266.3		4																		
165.7	266.6								28								38	52	117	73	107
165.9	266.9		2	14			1	3	9			3		2	5						
166.2	267.4								17									1		1	8
166.4	267.7																	9			
166.6	268.1						6		21					6		1			1	8	21
167.9	270.2																	1			2
168.1	270.5																	1			
168.6	271.3																	1	8		1
168.7	271.4							5	6	3							7	47	90	72	67
169.7	273.0				1						1	1						11	31	23	22
169.9	273.4																		1		
171.9	276.6																				1



### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
172.5	277.6		1									3		4	1	1	18	11	1	11	2
173.9	279.8		1													1	1		2	9	
175.2	281.9																2				
175.7	282.7																	1	1		
175.9	283.0																			4	2
176.5	284.0										1					2	1		2		
176.7	284.3																			7	1
177.9	286.2																			1	
178.3	286.9									1							3			10	
178.5	287.2															2			38	1	
178.9	287.9				1					1				2	7	13		18	10	11	7
179.5	288.8																			6	
179.6	289.0								6	13	21	32	5	16	40	56	72	92	110	99	128
181.7	292.4														1	1	1	3	9	15	6
182.3	293.3																		8		10
183.1	294.6														2			4		2	
183.4	295.1																		1	8	
183.5	295.3																		11	9	2
184.7	297.2																		6	1	9
186.7	300.4																	3			
187.5	301.7																1	1			
187.7	302.0																1		7	3	
188.2	302.8														1	2	7	1	3	2	5
190.0	305.7										1								1	1	1
190.1	305.9									1							2	5	3		
190.2	306.0																			2	2
190.7	306.8																		3		

### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
190.8	307.0		1	5		2	5	1				1		4	2	5	18	28	6	17	4
191.0	307.3																		2	2	
191.1	307.5																			1	1
191.6	308.3																				2
191.7	308.4	2	2	4											1		3	10	11	6	1
193.0	310.5																	28	18	22	21
193.2	310.9																		1		
193.4	311.2				5	2				2		2	1	4				5	3	1	
193.6	311.5																6	1	9	6	3
193.7	311.7		4					6	1	2	1		2	3		5	8	8		11	4
193.8	311.8								1	1	1				1	2	1	1		3	
194.0	312.1		2			3			1	2	4	2	6	14	11	11	22	26	20	21	21
194.1	312.3			2		2				5							1		1	6	4
194.4	312.8																	1	5	23	13
195.7	314.9																				17
196.0	315.4			3						2				1	6	10	20	23	34	29	26
196.2	315.7		1																25		
198.2	318.9											2		1	17	14	36	33	13	35	33
198.8	319.9		5		3	2	7	3		6	1	6		4	15	17	21	25	39	43	29
199.4	320.8								1			5			2	1	2			1	
201.0	323.4																				4
201.1	323.6														1	1	2	3	6		
203.1	326.8													10				1	10		
204.1	328.4		1																		
205.3	330.3						3				1			3	6	2		11	17	12	16
205.4	330.5		1									2				4		2	4	5	2
205.7	331.0																		2		1

### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
206.4	332.1		1	4			1	2	1		2			2	4		2	2	10	15	8
206.6	332.4														2	1		1	5	2	2
207.5	333.9																			1	1
207.7	334.2														2			3	3		
207.8	334.4			1								3	2		5			1	3	4	5
207.9	334.5			2																	
208.0	334.7				1						2	9	5	13	36	17	26	37	62	51	52
208.1	334.8																	1			
208.3	335.2														4						1
209.1	336.4														1			1			
209.7	337.4		1												1			2			
210.8	339.2																		1		
211.9	340.9								2					11	10	6	14	25	30	28	20
212.2	341.4										2			17	24	28	37	37	34	27	29
212.3	341.6														2	3	9	9	4	12	7
213.3	343.2				2							1				1	6	9	12	6	9
213.5	343.5											1			2	1	2	4	6	5	5
213.7	343.8					1		2						4	1	1	6	7	1	13	3
213.9	344.2																			2	
214.5	345.1								1								1	4	3	7	6
214.7	345.5		2																		
215.4	346.6													1	2				3	3	6
216.1	347.7									1				3	1	2	6	4	6	9	9
216.9	349.0														4	5	7	21	23	53	36
217.3	349.6							1	3		1			4	24	6	13	22	42	36	35
217.8	350.4				1														2		
218.2	351.1		1																		1

### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
218.5	351.6														3	3		16	11	47	66
218.6	351.7														1						
218.7	351.9										4	7		4	12	5	15	17	20	16	18
219.0	352.4										3	2		4	5	6	3	11	7	12	7
219.3	352.9			2				1		3		2	3	6	8	5	7	13	12	17	13
220.7	355.1																		4	1	
221.0	355.6																	1			
221.5	356.4																1				
222.3	357.7																	2		6	
222.7	358.3				1										6		1		8	14	3
222.8	358.5	2	3													5				2	
222.9	358.6				3				3	1					9		4	20	19	21	17
223.2	359.1									3	3				3			1			1
223.7	359.9			1																	
224.7	361.5													3					12	15	7
225.0	362.0														2			2		1	1
225.1	362.2														3			1	3		1
226.7	364.8														2						
227.5	366.0																				3
228.0	366.9														2				1		
228.7	368.0																			3	
231.3	372.2																	1	1	2	2
235.0	378.1																			57	40
235.1	378.3										1			1	2	3	8	21	66		
235.6	379.1																				2
235.7	379.2		4		3					5	2	7	1	4	11	16	16	22	16	25	33

### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
236.0	379.7	1	1	2	1										2	1			2	3	6
236.1	379.9															1	1	1		2	2
236.3	380.2																			1	1
236.7	380.9		1																		
237.0	381.3								5	3	1		2	8	6	13	14	26	20	26	23
238.1	383.1																			1	
238.3	383.4														1	1		2	1		1
238.6	383.9		2		2						1				4	4	8	13	23	16	21
239.4	385.2																		6		
240.4	386.8																			15	16
240.5	387.0		6									1		2	8	1	3	11	11	36	32
240.7	387.3				3		6					1	1	4	7	11	13	21	24		1
241.0	387.8												1				4	5	8	8	6
242.3	389.9																				4
242.8	390.7													1		4	4	9	13	21	25
243.0	391.0														2						
243.3	391.5		1		1											4					14
243.5	391.8											2		1			5		13	12	
243.8	392.3																		2	2	1
244.0	392.6														2			12		8	9
244.3	393.1																	2			
244.5	393.4																			25	29
244.6	393.6				1	2									1	2	9	13	31		
244.7	393.7																		2	1	2
245.2	394.5																			1	

### Appendix 3 (Continued)

Fall Chinook salmon redds counted in the Snake River during aerial and underwater searches, by river mile (RM), river kilometer (RK), and year (1986-2005). An empty cell indicates no redds were observed at the corresponding site and year.

RM	RK	Year																			
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
245.3	394.7														1		1		9	7	
245.5	395.0																				10
245.7	395.3										2								2	6	2
245.8	395.5														2		1	4	6	9	9
246.0	395.8																				1
246.5	396.6			1																	
247.5	398.2																		4	2	2
		7	66	64	58	37	51	47	127	67	65	104	58	185	373	346	709	1,113	1,512	1,709	1,442

#### Appendix 4

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988–2005). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2005.

RM	RK	Redds counted by year																	
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4.0	6.4		1						1										
6.2	10.0									5									
6.7	10.8														2				
7.2	11.6														2				
7.8	12.6														7	6			
8.0	12.8												1						
8.1	13.0	9				1	2	6	6			1							
8.8	14.2														1	5			
10.6	17.1			1															
11.8	19.0						1												
13.9	22.4		4	3							1		2	8	12			7	
16.2	26.1															1			
17.3	27.8										1	2	1			2			3
18.0	29.0	4	3		1						1	2	15	2	18	22	36	45	38
18.6	29.9										1						6		
18.9	30.4												1						
19.0	30.6					2													
19.1	30.7												3		6	17	8	7	9
19.3	31.1										1	4	5					31	7
19.5	31.4													7	14	1	11	1	
20.0	32.2		2						4	6	1								
21.0	33.8																		3
21.7	34.9														2	1	7	3	6

#### Appendix 4 (Continued)

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988-2005). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2005.

RM	RK	Redds counted by year																	
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
21.8	35.0												1						
22.0	35.4	8				21	9	18	5	24	16	25	62	77	60	110	107	119	139
22.2	35.7																49	22	31
23.0	37.0				3										29				
23.3	37.5															9	3	18	36
23.4	37.7										1								
24.0	38.6														1			7	
25.5	41.0															1	5		
26.3	42.3																2		
26.5	42.6													3	2	20	4	18	9
26.8	43.1											1							
27.5	44.2											2				15	7	6	6
28.0	45.1							1								48	20		
28.4	45.7										11	1	26	1				20	20
30.1	48.4															3	5	35	
31.5	50.7														3	28	3	37	
31.7	51.0									4		6					37		
32.5	52.3												23	13	19	11		20	10
32.8	52.8															4			
33.6	54.0							13											
33.8	54.4													6					
34.0	54.7										9	4	9	2	13	42	20	15	26
34.2	55.0									10									



#### Appendix 4 (Continued)

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988-2005). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2005.

RM	RK	Redds counted by year																	
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
35.0	56.3								3	6	7								
35.4	56.9												2	9	47	41	53	50	25
35.7	57.5												3		1	7	7		
36.2	58.2										6	11	3	11		7	4	10	16
36.7	59.0							1											
37.9	61.0														1	8	1	1	
39.1	62.9																1	9	
39.6	63.7										1	9	1		4	2	1		1
40.3	64.8					1	11	4	1	11	1	10	21	22	46	109	147	111	48
40.6	65.3													3					
43.2	69.5															1	1		6
45.0	72.4													3	9	2	2	10	8
49.2	79.2													1				3	
49.4	79.5																1		
49.8	80.1																	1	
51.2	82.4																	3	
51.5	82.9																	5	3
51.7	83.2													3					1
52.0	83.7					1									3				
52.2	84.0																		5
52.5	84.5																		3
52.8	85.0																3	2	4
53.4	85.9												2						

#### Appendix 4 (Continued)

Fall Chinook salmon redds counted in the Clearwater River during aerial searches, by river mile (RM), river kilometer (RK), and year (1988-2005). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 41 (North Fork Clearwater River) from 1988 to 1990, 67 (Kamiah, Idaho) in 1991, and 74 (beginning of Middle Fork Clearwater River) from 1992 to 2005.

RM	RK	Redds counted by year																	
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
53.8	86.6																	12	10
57.2	92.0																9		
58.2	93.6																		2
61.0	98.1													1					
62.4	100.4																1		
66.0	106.2														4	1			8
68.0	109.4																		4
70.2	113.0																2		
		21	10	4	4	26	36	30	20	66	58	78	181	172	306	524	563	628	487

### Appendix 5

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992–2005). An empty cell indicates no redds were observed at the corresponding site and year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2005.

RM	RK	Redd counts by year													
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
0.1	0.2										12		2	1	
0.5	0.8												2		
0.7	1.1										22				18
0.8	1.3											2			
1.0	1.6										2		4	2	
1.2	1.9										2				
1.7	2.7														11
1.9	3.1										3	8			
2.0	3.2										2			30	33
2.1	3.4		2										2		
2.2	3.5										4				
2.4	3.9													2	
3.0	4.8							1			1	1			
3.2	5.1	1	1				1	1			7	5	2	3	
3.3	5.3													1	1
3.5	5.6												1		
3.6	5.8				2	2				1	14	3	4	31	3
3.7	6.0														16
4.3	6.9													4	3
4.4	7.1	2	4				1	3	1	1	1	9	6	2	3
4.5	7.2										2	1	3		
4.6	7.4		2			1					7		1	1	4
5.5	8.8										8			1	
6.2	10.0										4				
6.5	10.5												1		
6.8	10.9										1				
7.9	12.7										1				
8.2	13.2											1	1		1
8.5	13.7										7				
8.9	14.3												1		
9.2	14.8										6			1	
9.6	15.4						1								
10.0	16.1											2		3	3
10.4	16.7											6			
10.5	16.9		5	1		6	7	2			9	6		13	7

### Appendix 5 (Continued)

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2005). An empty cell indicates no redds were observed at the corresponding site and year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2005.

RM	RK	Redd counts by year													
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
11.0	17.7												1		
11.4	18.3													1	
11.6	18.7		2									1			
11.7	18.8									3			2	2	
12.0	19.3									2					
12.5	20.1									12	4	4	3		
12.6	20.3		2				6	5		6				2	
12.7	20.4		2							3					1
13.2	21.2		3			1									
13.4	21.6													3	
13.8	22.2		7		4					1	2	3	8	4	
13.9	22.4										2				
14.2	22.8													2	
14.3	23.0													4	
15.0	24.1												1		
15.2	24.5														1
16.3	26.2												1	2	
16.8	27.0											1			
17.0	27.4			1											
17.6	28.3		2	3	5		9			10	13	5	6	4	
18.0	29.0						4						6		
18.6	29.9	1													
19.1	30.7									1	3				
19.2	30.9						3					2	2		
19.5	31.4							2							
20.0	32.2						4	5		2			1		1
21.0	33.8									3			1		1
21.5	34.6												2		
22.0	35.4									1					
22.1	35.6													1	1
22.2	35.7													1	
24.0	38.6													2	
24.4	39.3													1	
25.6	41.2		4												

### Appendix 5 (Continued)

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2005). An empty cell indicates no redds were observed at the corresponding site and year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2005.

RM	RK	Redd counts by year													
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
26.4	42.5			7							1		1		
26.7	43.0													1	
26.9	43.3												5		
27.1	43.6									2					
27.3	43.9									2			2		
27.9	44.9					3			6					1	
29.1	46.8											2	1	5	
29.3	47.1											1			
29.7	47.8											3			
29.8	47.9											1			
31.1	50.0											3		1	
32.2	51.8			1			1								
32.7	52.6						4								
33.1	53.3											1			
33.3	53.6	1		1		1	2	3			10	7	3		2
34.0	54.7		2												
36.4	58.6						1								
37.5	60.3										2				
37.6	60.5		2		1			2		2	2	4	4	4	3
37.7	60.7														1
37.8	60.8		7	1			3						2		1
38.4	61.8														1
39.0	62.8										3				
39.1	62.9						1								
41.3	66.5						2								
41.7	67.1		1												
41.8	67.3					1									
42.5	68.4												1		
43.2	69.5		1		3				2		11	8	1	1	
44.2	71.1														1
44.5	71.6											2		4	1
44.9	72.2									4		2	4	5	1
45.5	73.2														1
45.7	73.5											4		4	
45.9	73.9					4									
46.5	74.8				2										

### Appendix 5 (Continued)

Fall Chinook salmon redds counted in the Grande Ronde River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992-2005). An empty cell indicates no redds were observed at the corresponding site and year. Redd searches were also conducted from 1986 to 1991, however, no ground locations were recorded. Redd counts totaled 0 in 1986, 7 in 1987, 1 in 1988, 0 in 1989, 1 in 1990, and 0 in 1991. The maximum upstream RM searched was 4.5 in 1986, 36 in 1987, and 45.5 from 1988 to 1991, 45.3 in 1992, 53 in 1993 and 1994, 45.3 in 1995, and 53 from 1996 to 2005.

RM	RK	Redd counts by year													
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
47.5	76.4						1		4						
47.8	76.9										2		10		1
48.7	78.4													2	
49.3	79.3										3	1		1	
50.5	81.3						4								
51.5	82.9				1	1									
		5	49	15	18	20	55	24	13	8	197	111	93	162	129

### Appendix 6

Fall Chinook salmon redds counted in the Salmon River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992–2005). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 87 in 1992, 97 in 1993, 134 in 1994, 105 in 1995, 87 in 1996, 134 in 1997, 105 in 1998, 96 in 1999 and 2000, and 105 from 2001 to 2005.

RM	RK	Redds counted by year													
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
4.0	6.4												1	6	4
4.8	7.7										1			1	
5.3	8.5														2
5.5	8.8												1		
5.6	9.0												1		
12.1	19.5														1
14.2	22.8										1				5
15.0	24.1	1						1							
15.3	24.6										2				2
15.7	25.3										1				
16.0	25.7				1	1									
20.3	32.7												1		
20.6	33.1												2		
24.4	39.3													1	
26.1	42.0				1										
26.5	42.6										1				
30.9	49.7												5	8	10
31.1	50.0		1					1					1	1	3
31.4	50.5										1				
35.0	56.3						1								
35.7	57.4											11		1	
45.2	72.7											3			
48.8	78.5										3				
56.7	91.2										1				
62.0	99.8										3	8			
63.9	102.8											2	2		
65.0	104.6										2				
65.4	105.2							1				2			
65.7	105.7										2	3			
65.8	105.9										1				
68.5	110.2												2		
70.5	113.4										1				
70.6	113.6										1				
82.2	132.3													1	
85.0	136.8										1				
87.0	140.0			1											
91.0	146.4												1		
88.0	141.6											2			
90.7	146.0		2												
100.7	162.0												1		

### Appendix 6 (Continued)

Fall Chinook salmon redds counted in the Salmon River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992–2005). An empty cell indicates no redds were observed at the corresponding site and year. The maximum upstream RM searched was 87 in 1992, 97 in 1993, 134 in 1994, 105 in 1995, 87 in 1996, 134 in 1997, 105 in 1998, 96 in 1999 and 2000, and 105 from 2001 to 2005.

RM	RK	Redds counted by year													
		1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
110.0	177.0													2	
		1	3	1	2	1	1	3	0	0	22	31	18	21	27



### Appendix 7

Fall Chinook salmon redds counted in the Imnaha River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992–2005). An empty cell indicates no redds were observed at the corresponding site and year. A dash indicates no searches were conducted in the corresponding site and year. Redd searches were also conducted from 1987 to 1991, and in 1999, 2001, and 2003, however, no ground locations were recorded. Redd counts totaled 0 in 1987, one in 1988 and 1989, three in 1990, four in 1991, and three in 1992, nine in 1999, 38 in 2001, and 43 in 2003. The maximum upstream RM searched was 4.1, 19, 9.8, 3.8, 3.8, 14, 35, 35, and 19, respectively.

RM	RK	1993	1994	1995	1996	1997	1998	----	2000	-----	2002	-----	2004	2005
N.D.	N.D.													
0.2	0.3										3			
0.3	0.5										7			
0.4	0.6										3		3	4
0.5	0.8	1		1	2	1	1		1				4	4
0.6	1.0										2			
0.6	1.0	1			1		2		2					
0.9	1.4										2			1
1.0	1.6					2	1						2	1
1.2	1.9						1						1	
1.3	2.1										1		1	
1.4	2.3						1							
1.5	2.4										3			
1.6	2.6										3			
1.7	2.7										2			2
1.8	2.9			2							1			
2.0	3.2										2			
2.3	3.7										1			
2.4	3.9						2		2		7		2	3
2.5	4.0										9			
2.7	4.3										2		2	
2.8	4.5												1	
2.9	4.7										1			
3.0	4.8								2					
3.2	5.1													2
3.4	5.5						1				2			1
3.5	5.6													2
3.7	6.0	2									1			
3.8	6.1												1	2
4.0	6.4													2
4.1	6.6			1							1			2
4.4	7.1				-								1	
5.4	8.7	-	-		-						1			1
6.0	9.7	-	-		-								1	
6.5	10.5	-	-		-				1				2	
7.0	11.3	-	-		-								1	1
7.1	11.4	-	-		-						10			
7.7	12.4	-	-		-									1
7.8	12.6	-	-		-								9	2

### Appendix 7 (Continued)

Fall Chinook salmon redds counted in the Imnaha River during aerial searches, by river mile (RM), river kilometer (RK), and year (1992–2005). An empty cell indicates no redds were observed at the corresponding site and year. A dash indicates no searches were conducted in the corresponding site and year. Redd searches were also conducted from 1987 to 1991, and in 1999, 2001, and 2003, however, no ground locations were recorded. Redd counts totaled 0 in 1987, one in 1988 and 1989, three in 1990, four in 1991, three in 1992, nine in 1999, 38 in 2001, 43 in 2003, 35 in 2004, and 19 in 2005. The maximum upstream RM searched was 4.1, 19, 9.8, 3.8, 3.8, 14, 35, 35, and 19 respectively.

RM	RK	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
7.9	12.7	-	-		-									1
8.2	13.2	-	-		-								1	
8.9	14.3	-	-		-								1	1
9.3	15.0	-	-		-								1	
9.8	15.8	-	-		-									1
9.9	15.9	-	-		-						1			1
10.0	16.1	-	-		-		2		1					
12.0	19.3	-	-		-		1							
12.8	20.6	-	-		-						1			
13.0	20.9	-	-		-		1				1			
13.4	21.6	-	-		-						2			1
13.5	21.7	-	-		-						1			
14.3	23.0	-	-		-								1	
18.2	29.3	-	-		-						1			
20.7	33.3	-	-		-						1			
		4	0	4	3	3	13	----	9	----	72	----	35	36